

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number  
**WO 2004/002561 A2**

(51) International Patent Classification<sup>7</sup>: **A61M 16/00**,  
A61B 5/087

[CA/CA]; 3611-55 Harbour Square, Toronto, Ontario M5J 2L1 (CA).

(21) International Application Number:  
PCT/CA2003/000976

(74) Agent: **STEWART, Michael, I.**; Sim & McBurney, 6th Floor, 330 University Avenue, Toronto, Ontario M5G 1R7 (CA).

(22) International Filing Date: 27 June 2003 (27.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/391,594 27 June 2002 (27.06.2002) US

(71) Applicant (for all designated States except US): **YRT LIMITED** [CA/CA]; 3611-55 Harbour Square, Toronto, Ontario M5J 2L1 (CA).

(72) Inventor; and

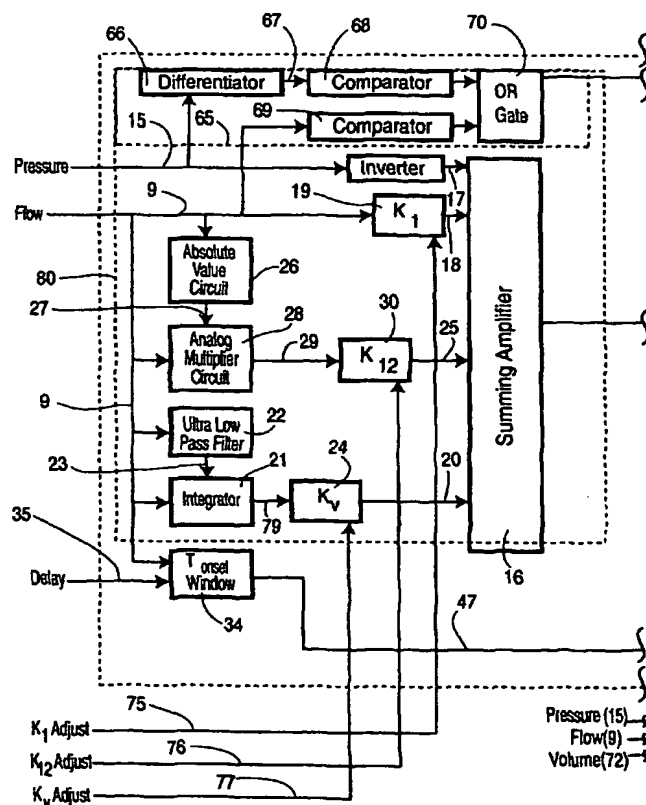
(75) Inventor/Applicant (for US only): **YOUNES, Magdy**

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

[Continued on next page]

(54) Title: METHOD AND DEVICE FOR MONITORING AND IMPROVING PATIENT-VENTILATOR INTERACTION



(57) Abstract: Method and apparatus for non-invasively determining the time onset ( $T_{onset}$ ) and end ( $T_{end}$ ) of patient inspiratory efforts. A composite pressure signal is generated comprising the sum of an airway pressure signal, a gas flow pressure signal obtained by applying a gain factor ( $K_f$ ) to a signal representing gas flow rate and a gas volume pressure signal obtained by applying a gain factor ( $K_v$ ) to a signal representing volume of gas flow.  $K_f$  and  $K_v$  values are adjusted to result in a desired linear trajectory of composite pressure signal baseline in the latter part of the exhalation phase. The current composite pressure signal is compared with (i) selected earlier composite pressure signal values and/or (ii) value expected at current time based on extrapolation of composite pressure signal trajectory at specified earlier times and/or (iii) the current rate of change in the composite pressure signal with a selected earlier rates of change. The differences obtained by the comparison are compared with selected threshold values.  $T_{onset}$  is identified when at least one of the differences exceeds the threshold values.



SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

— *without international search report and to be republished upon receipt of that report*